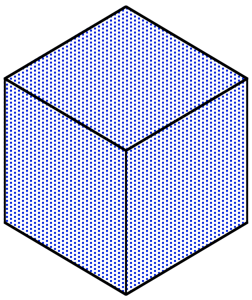
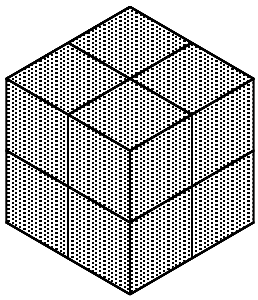
Cubic Cut-ups



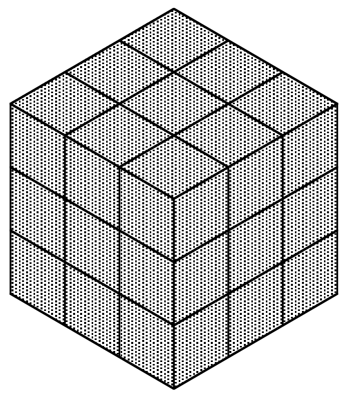


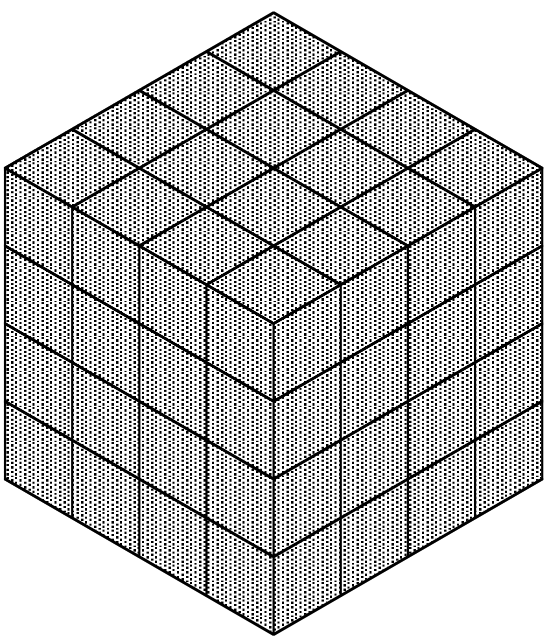
A cube of wood was painted red on all sides. After the paint was dry, the block was cut in half along each side, as shown.

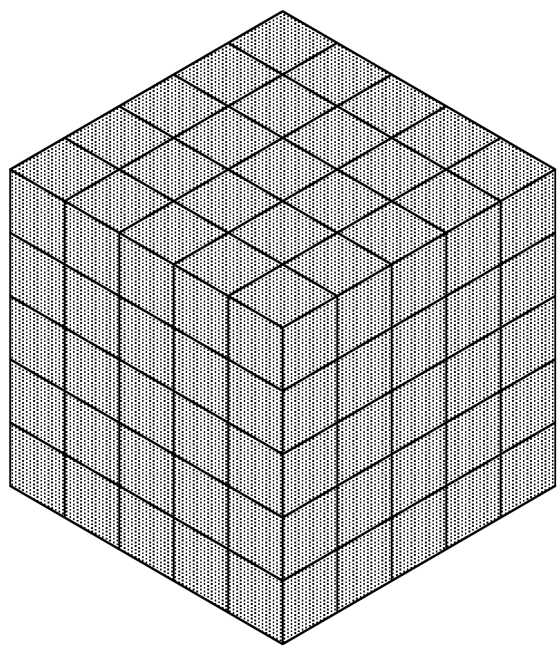
How many small blocks are formed? How many red faces do the small blocks have?

Other red cubes were cut in thirds, fourths, and fifths along each side. How many small cubes? How many cubes have:

6 red faces?
5 red faces?
4 red faces?
3 red faces?
2 red faces?
1 red face?
no red faces?







Make a table for these cubes and predict the results for the next five cubes in the sequence:

Number of cuts in each direction	Number of small cubes	Number of small cubes with Three red faces	Two red faces	One red face	No red faces
1					
2					
3					
4					
5					
6					
7					
8					
9					

Generalize:

If a cube is cut with **N** cuts in each direction, write a functio n ("rule") that describes:

- The total number of small cubes formed:
- The number of small cubes with three colored faces:
- The number of small cubes with two colored faces:
- The number of small cubes with one colored face:
- The number of small cubes with no colored faces: